

# Energy Situation and Energy Conservation in Taiwan

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TAIWAN, ROC

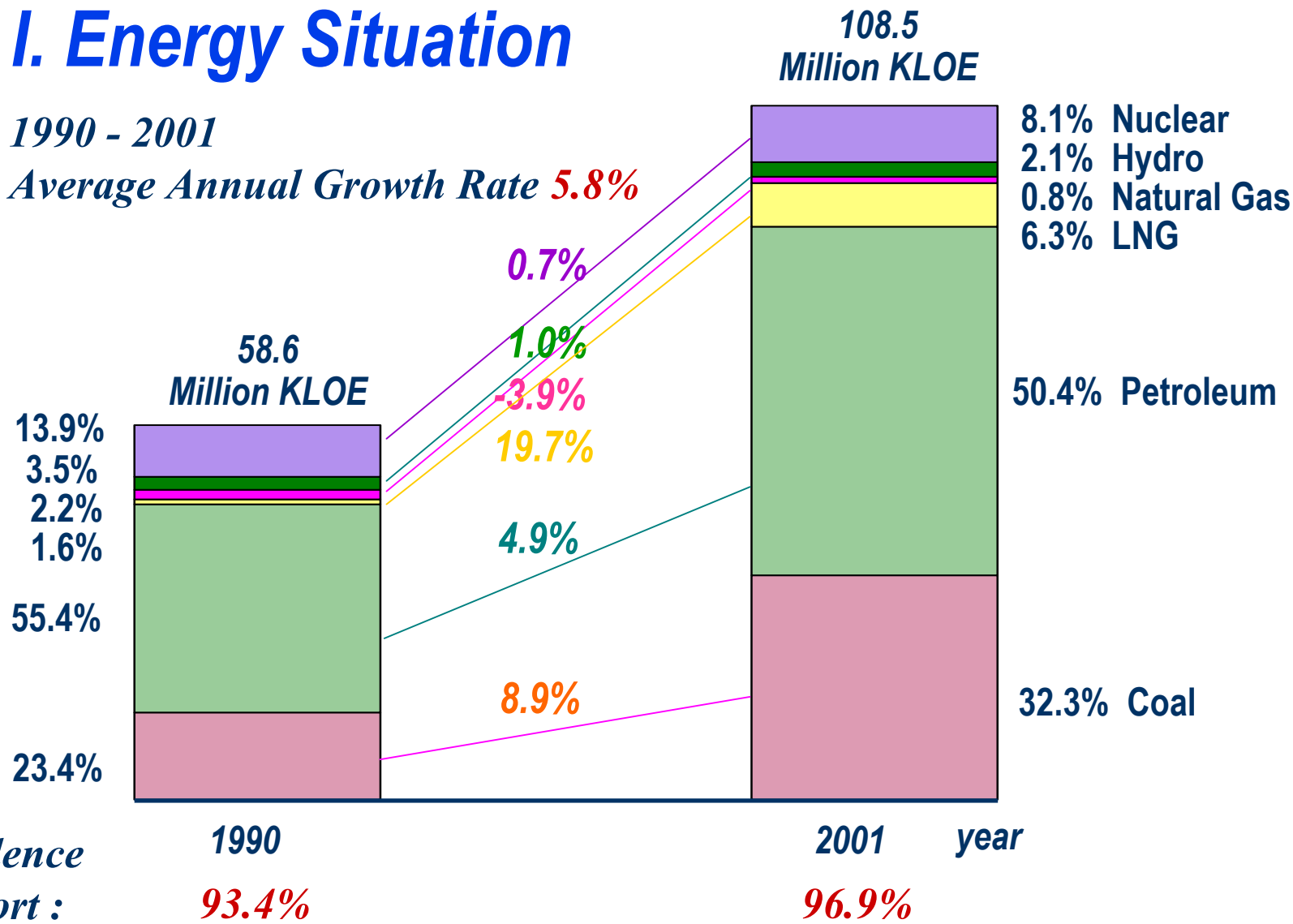
December 10, 2002

# Structure of Energy Supply

## I. Energy Situation

1990 - 2001

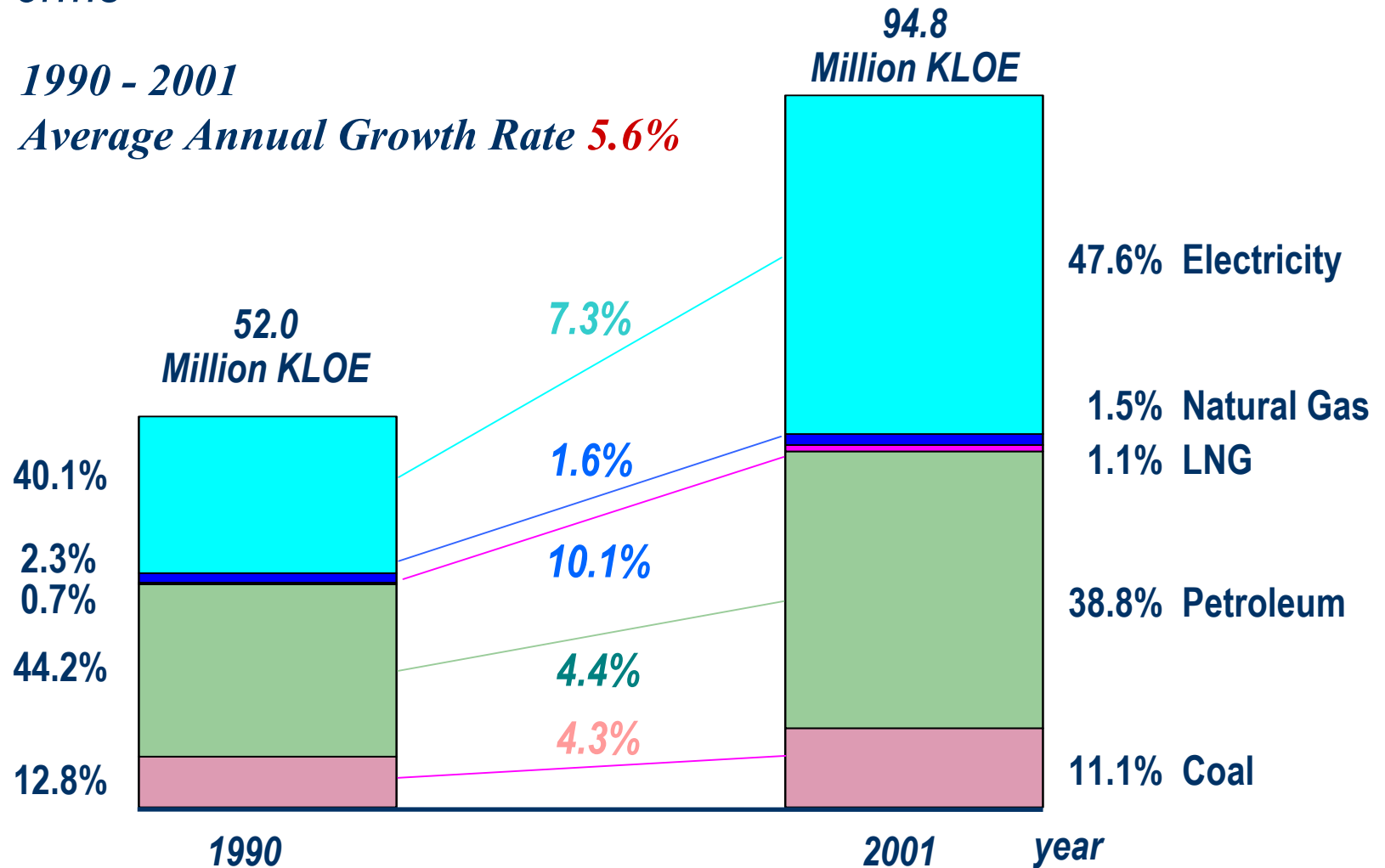
Average Annual Growth Rate **5.8%**



# Structure of Energy Consumption - By Energy Forms

*1990 - 2001*

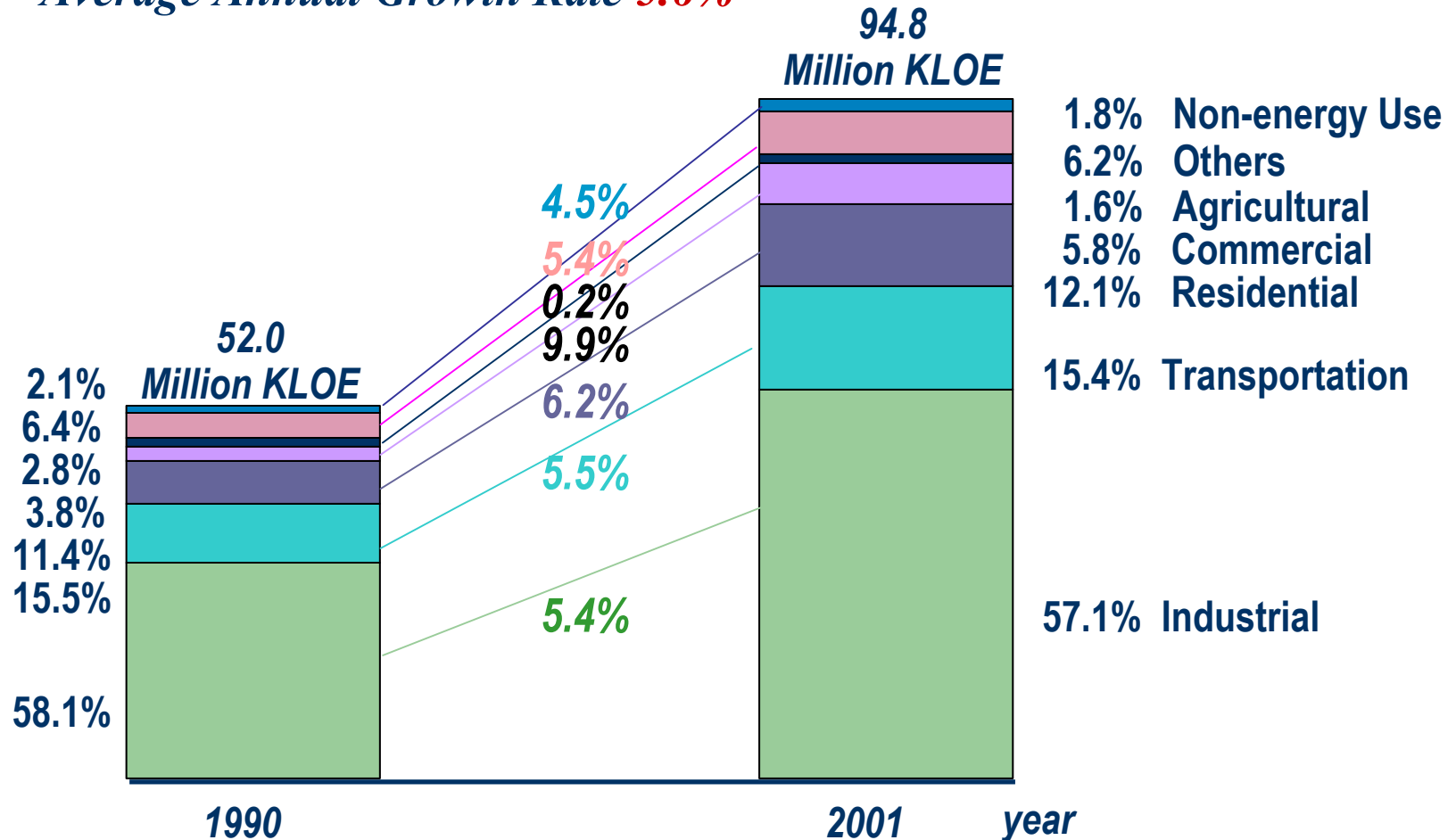
*Average Annual Growth Rate 5.6%*



# Structure of Energy Consumption - By Sectors

*1990 - 2001*

*Average Annual Growth Rate 5.6%*

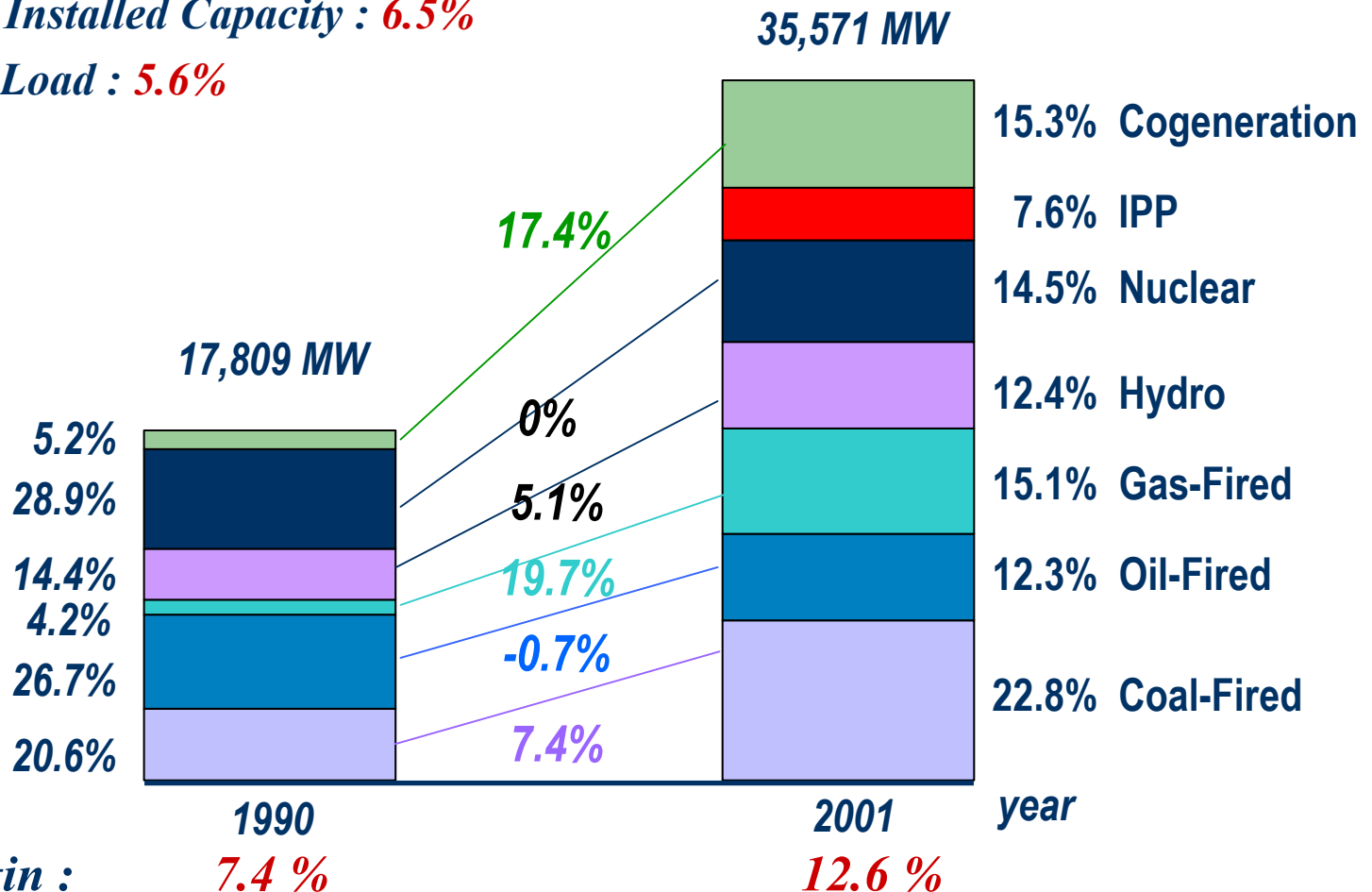


# Installed Capacity of Power Stations

## 1990 - 2001 Average Annual Growth Rate

• **Total Installed Capacity : 6.5%**

• **Peak Load : 5.6%**



**Reserve Margin :**

**7.4 %**

**12.6 %**

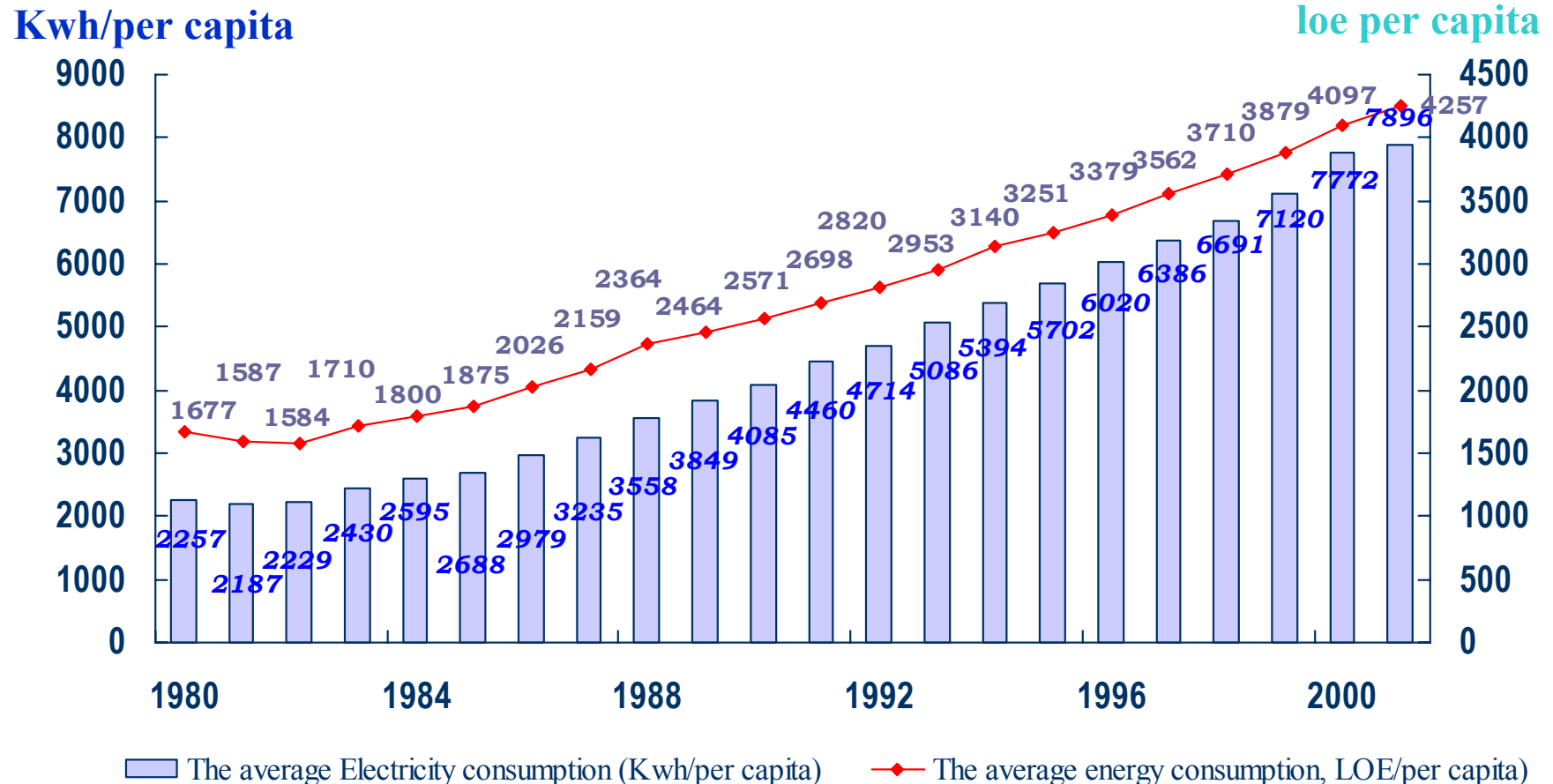
**Per Capita Electricity  
Consumption :**

**4,085 KWh**

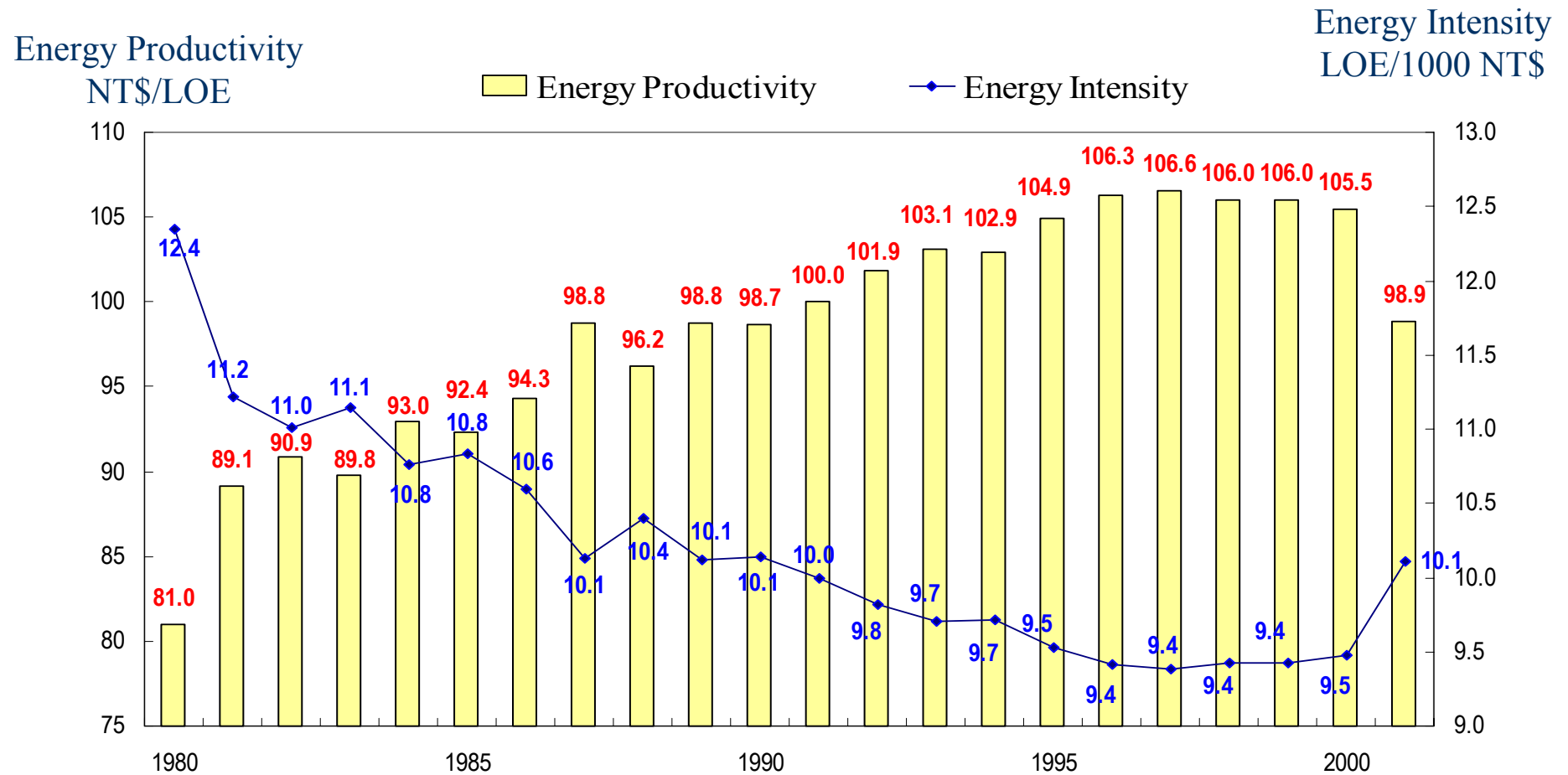
**7,896 KWh**

# The Variation of Average Energy Consumption & Electricity Consumption in Taiwan, per capita

- Between 1980 and 2001
- The growth of average annual energy consumption was 4.5%
  - The growth of average annual electricity consumption was 6.1%

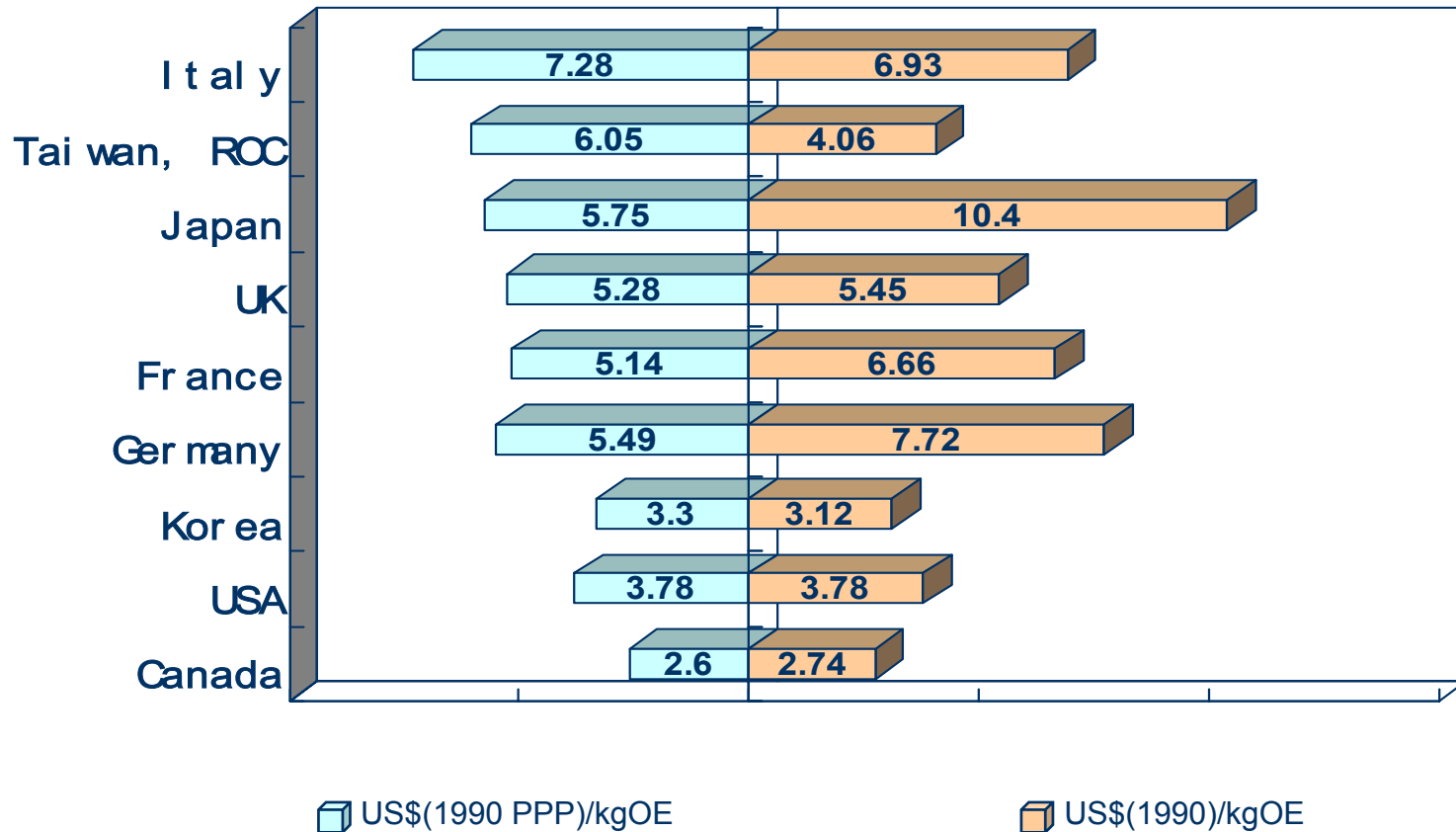


# Energy Productivity



# The Comparison of Energy Productivity in Major Nations

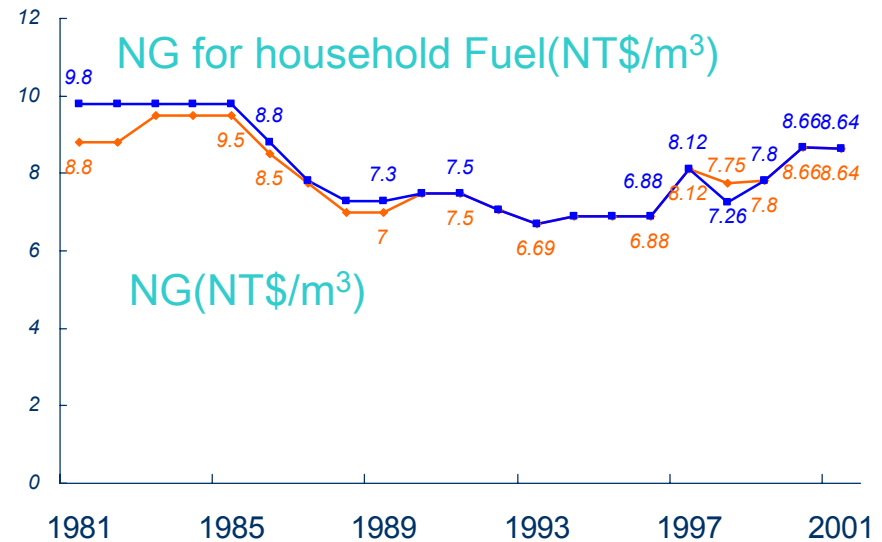
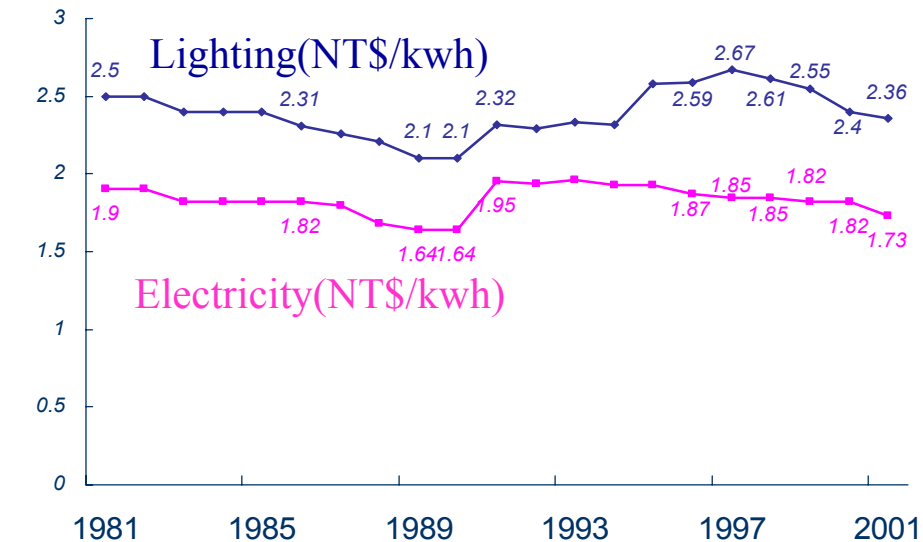
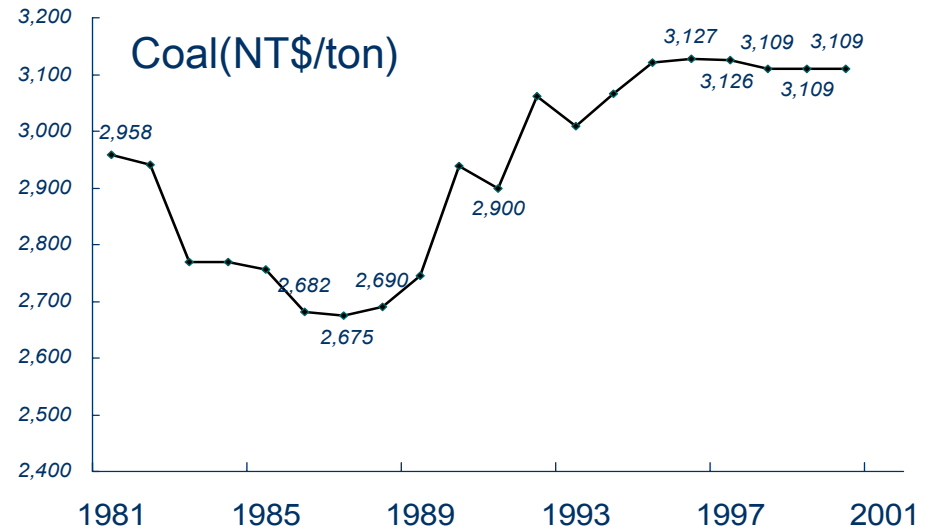
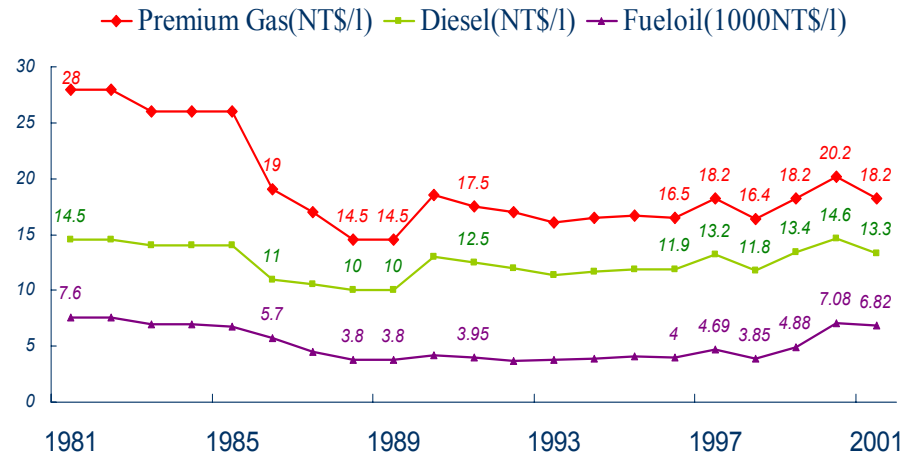
1999



Source: Energy Balance of OECD Countries, Energy Statistics and Balance of Non-OECD Countries, 2000  
\* PPP (Purchasing Power Parity)



# History of Energy Price in Taiwan



# Introduction: Brief View of TAIWAN

- Area : 36,188 square kilometers
- Population : over 22.3 million(growing 0.44 % per year )
- Summer Temperature : 23.4°C to 30.3°C
- Winter Temperature : 12.1°C to 18.9°C
- Typhoons occur in summer and rains liberally in all seasons

# Energy Consumption in Taiwan

- 29.58 KLOE in 1980 increased to 94.83 KLOE in 2001
- 1980 to 2001 annual average growth rate :
  - Energy consumption : 5.7%
  - GDP : 6.7%
  - Energy demand elasticity : 0.85

# Energy Supply in Taiwan

ITEM	1980		1990		2001	
	Million KLOE	%	Million KLOE	%	Million KLOE	%
<b>Total Supply</b>	<b>34.3</b>	<b>100</b>	<b>58.6</b>	<b>100</b>	<b>108.5</b>	<b>100</b>
Indigenous	4.7	14	3.8	7	3.2	3
Imported	29.6	86	54.8	93	105.4	97
Coal	5.2	15	13.7	23	35.1	32
Petroleum	24.4	71	32.5	55	54.7	50
Natural Gas	2.0	6	1.3	2	0.8	1
LNG	-	-	0.9	2	6.8	6
Hydro Power	0.7	2	2.0	4	2.3	2
Nuclear Power	2.0	6	8.2	14	8.8	8

# Energy Consumption in Taiwan

ITEM	1980		1990		2001	
	Million KLOE	%	Million KLOE	%	Million KLOE	%
<b>Domestic Consumption (by sector)</b>	<b>29.6</b>	<b>100</b>	<b>52.0</b>	<b>100</b>	<b>94.8</b>	<b>100</b>
Industrial Sector	19.2	65	30.2	58	54.1	57
Transportation Sector	3.6	12	8.1	16	14.6	15
Agricultural Sector	1.0	3	1.5	3	1.5	2
Residential Sector	2.9	10	5.9	11	11.5	12
Commercial Sector	0.6	2	2.0	4	5.5	6
Others	1.8	6	3.3	6	5.9	6
Non-energy Use	0.5	2	1.1	2	1.7	2
<b>Domestic Consumption (by energy form)</b>	<b>29.6</b>	<b>100</b>	<b>52.0</b>	<b>100</b>	<b>94.8</b>	<b>100</b>
Coal	2.5	8	6.6	13	10.5	11
Petroleum	15.4	52	23.0	44	36.8	39
Natural Gas	1.7	6	1.5	3	2.4	3
Electricity	9.9	34	20.9	40	45.1	48

# Cost of Energy in Taiwan

- The ratio of energy cost over total manufacturing cost :
  - Cement industry : 28%~34%
  - Textile industry : 5%~7%
  - Petrochemical industry : 4%~6%
  - Iron and steel industry : 4%~5.5% (exclude the coking coal)
  - Semiconductor industry : 2%~3.5%

# Energy Prices in Taiwan

ITEM	1998 Jan.	1999 Jan.	2000 Jan.	2001 Jan.
LPG(per kg)*	33.47	29.67	32.57	43.44
Unleaded Gasoline (95)	53.77	50.85	59.28	61.80
Jet Fuel	30.28	26.82	29.48	28.97
Diesel Oil	39.00	36.59	43.65	44.97
Fuel Oil(0.5% S)	15.36	13.68	17.72	23.32
Electricity**	6.38	6.53	6.88	6.46
Exchange Rate(1 U\$ = NT)	33.85	32.25	30.70	32.69

\*Wholesale Prices \*\*Average Price

UNIT : US cents/liter for Petroleum Product , US  
Cents/kwh for Electricity

# Distribution of electrical cost of building in Taiwan

ITEM	Season	Air Conditioning	Lighting	Motor & Pump
Office	Summer	41	35	24
	Winter	19	57	24
Department Store	Summer	36	44	20
	Winter	29	50	21
Hotel	Summer	50	26	24
	Winter	30	31	39
Hospital	Summer	58	31	11
	Winter	42	38	20



# Energy Conservation Policy in Taiwan

- Policy : cope with the actual needs of energy supply and coordinate with domestic economic development
- Target : establish a liberalized, orderly, efficient, and clean energy supply and demand system
- National Energy Conference : 28 % in total energy saving compared with the base year of 1996, by the year 2020

# Plan and Promotion for Energy

- Industrial Sector
  - Establish energy efficiency index and auditing system
  - Implement an auditing system for energy users
  - Promote voluntary energy-saving program
  - Enhance energy efficiency standards of equipment
  - Expand financial incentives for energy conservation
  - Strengthen energy conservation technical services
- Transportation Sector
  - Enhance and revise fuel economy standards for vehicles
  - Expedite procurement of energy-saving vehicles
  - Establish a sound public transportation system
  - Promote fuel tax collection at point of sale rather than on the vehicle imposition base
  - Implement a management strategy for the transportation system
  - Develop intelligent transportation systems

# Plan and Promotion for Energy (cont.)

- Residential and Commercial Sector
  - Raise the energy efficiency standard of electrical appliances
  - Strengthen the building envelope energy consumption index
  - Establish inspection system for energy conservation of buildings
  - Establish a total energy consumption control system for buildings
- Power Sector
  - Enhance efficiency of power generating plants
  - Enhance transmission and distribution efficiency
  - Promote cogeneration system
  - Conduct demand-side management measures

# Plan and Promotion for Energy(cont.)

- Development of Energy Conservation Technology
  - Green-building energy saving technology
  - Industrial energy-efficiency enhancing technology
  - High efficiency equipment production technology
  - Innovative energy-saving product technology
- Education and Guidance
  - Energy conservation education in schools
  - Industrial energy conservation training
  - Energy conservation education for the public

# Energy Conservation Achievements

- Energy auditing : savings 750 GWH of electricity, 146,000 kiloliters of oil and 92,000 tans of coal in 2000
- Energy-consumption standards management for electric appliances : peak load power saving 160 MW
- Fuel economy standards management : fuel saving of 130,000 kiloliters
- Energy conservation technical services : savings 170 GWH of electricity、 14,000 kiloliters of oil、 peak load power saving of 40 MW in 2000
- Shifting on-peak energy usage to off-peak hours measures : clipped 4,336 MW peak load

# Energy Conservation Achievements(Continue)

- Promotion cogeneration system : installation capacity reached 4,640 MW
- Incentives to procure energy-conservation equipment : 2-year accelerated-depreciation、 10% to 20% tax credit、 low-interest loan
- Approved depreciation to corporations for investing in energy-conservation equipment : NT 8.57 billion
- Implementation of low-interest loans : NT 11.1 billion
- Implementation of tax credit : NT 370 million

# Energy Conservation Achievements of R.O.C. in 2000

ITEM \ Energy Saving	Oil (kl)	Coal (tons)	Electricity (Gwh)	Peak Load Reduction (MW)
1. Energy Auditing System	146,000	92,000	750	-
2. Standards management for Electric Appliances	-	-	-	160
3. Standards Management for New Vehicles & Fishing Boat Engines	130,000	-	-	-
4. Technical Services	14,000	-	170	40
5. DSM (Load Shifting)	-	-	-	4,336
6. Promotion of cogeneration	-	-	-	(4,640)
7. Financial Incentives for investing in energy conservation equipment	❖ 10% to 20% tax credit : 370 billion NT dollars approved from 1994 to the present ❖ Low-interest loans : 11.1 billion NT dollars approved from 1994 to the present ❖ Accelerated depreciation : 8.57 billion NT dollars approved from 1991 to the present			

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services to lo

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## ITRI's Open Lab

provides space an  
resources throu  
business and product  
with ITI



### ITRI's Incubator

helps entrepre  
new techn  
busini



# ITRI's Mission

- ITRI was established to accelerate industrial technology development. Its accomplishments include establishing high-tech industries, applying various technologies to those industries, improving industrial structures, advancing Taiwan's international market competitiveness, promoting environmental protection, and enhancing the quality of life.
- Besides meeting industry's needs and carrying out industry-oriented projects, ITRI has dedicated itself to strengthening its capacity for forward-looking technological research and development to give industry even greater technology advantages. ITRI has always intended to be a leading source of industrial development and a world-class industrial technology research institute.



# Energy & Resource Laboratories

- Energy Technology
  - Thermofluids Technology
  - Electro-Technology
  - Combustion Technology
  - New Energy
- Resources Technology
  - Drilling and Borehole Logging、Rock and Soil Mechanics、Geophysics、Soil and Groundwater Monitoring、Remote Sensing、Oceanography